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ABSTRACT

Each publication in the Eisenhower National Clearinghouse (ENC) Focus series presents a small selection of the Clearinghouse collection focused on a topic of particular interest to mathematics and science teachers. In addition to meeting general requirements for inclusion in the ENC collection, curriculum materials in the Focus series are: appropriate to the specific topic of the issue; support hands-on, active, inquiry-based methods of instruction; and are readily available. This issue offers a sampling of 20 useful teaching materials and other resources that incorporate principles about data reflected in mathematics and science education. Each one-page entry includes the title, author, date, publisher, grade level, target audience, material type, language, subjects covered, abstract, evaluation, and ordering information. Titles Include: "Data Analysis and Statistics across the Curriculum," "Patterns and Predictions," and Internet Activities Using Scientific Data." (MKR)

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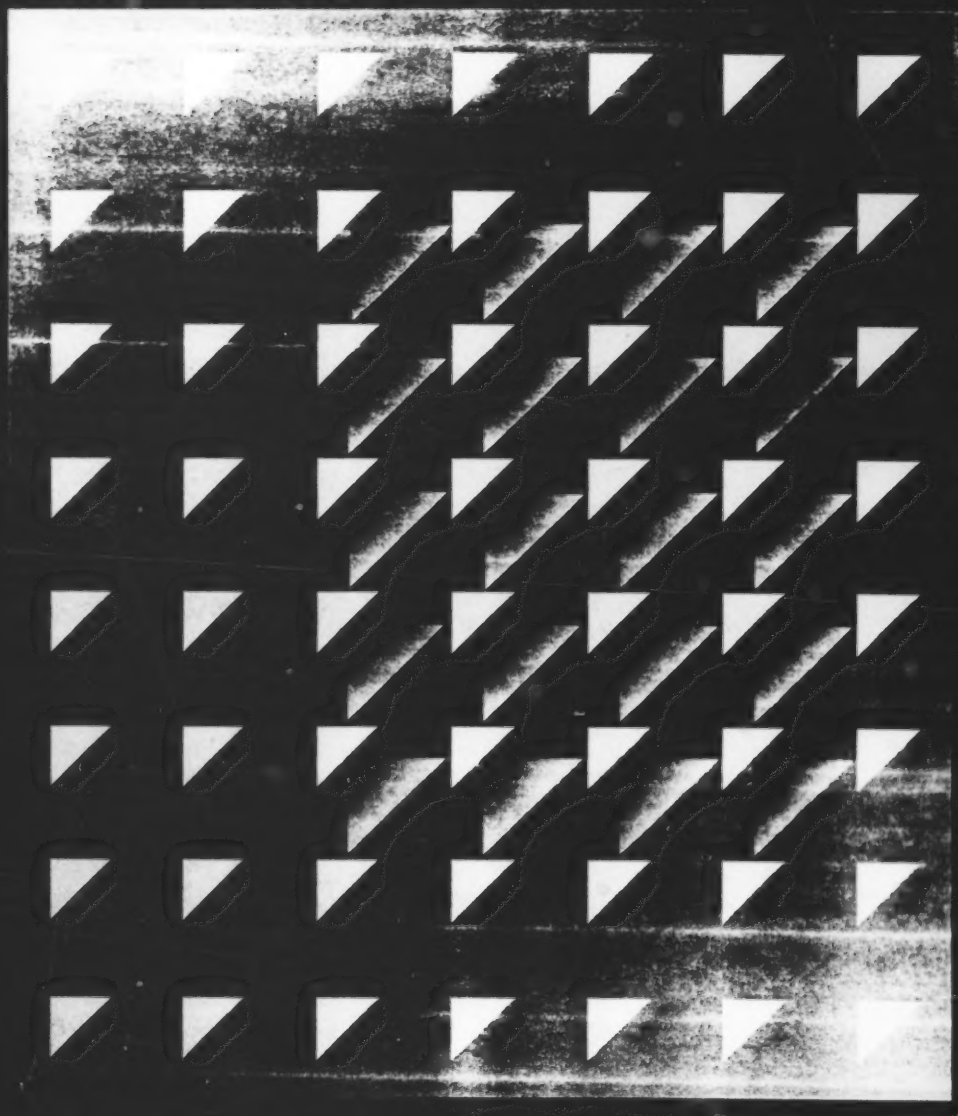
Issue 1, 1995–96

Eisenhower National Clearinghouse

enc FOCUS

For Mathematics and Science Education

Real Data Resources for Teachers



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Welcome to *ENC Focus: Real Data Resources for Teachers*

The *ENC Focus* series presents a selection of the Clearinghouse collection focused on a topic of particular interest to math and science teachers. The topic of this issue is the analysis and interpretation of actual data, whether collected by students themselves or provided by agencies such as NASA. By examining data that is meaningful to them, students gain a better understanding of the mathematics and science concepts stressed in these resources. Curriculum materials in these publications are appropriate to the specific topic of the issue and support the active involvement of students in their own learning. ENC provides teachers with a cross section of materials in different media or formats and at various grade levels, along with ordering and price information so the materials that seem useful can be easily obtained.

The Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) helps teachers by offering a broad assortment of services that enable them to quickly locate educational resources. In addition to these print catalogs, ENC's entire collection is cataloged online in the *ENC Catalog of Curriculum Resources*. The Clearinghouse also houses the national collection of these resources in a permanent repository. Although our materials are not available for loan, teachers who come to the Clearinghouse can examine our collection of textbooks, run the software, and view the CD-ROMs in order to make informed decisions about the materials they want to purchase for their classrooms. ENC also provides 12 demonstration sites located throughout the country so that teachers can learn how to use ENC's online services and preview selected curriculum resources. These sites are generally located in conjunction with the Eisenhower Regional Consortia (see contact names and addresses on the inside back cover of this publication).

Teachers are invited to suggest materials to be included in the national collection, submit materials they have developed, and encourage others to access ENC's database. In this way teachers can join us in promoting the effective use of technology to share resources with other educators and thus improve mathematics and science education.

The Eisenhower National Clearinghouse for Mathematics and Science Education is funded by the U.S. Department of Education, Office of Educational Research and Improvement.

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ENC FOCUS: Real Data Resources for Teachers

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To request copies of any issue of the *Focus* series, contact ENC at address above, or e-mail to focus@enc.org.

Past issues of *ENC Focus* are *Equity in the Classroom: Mathematics and Science Materials and Resources for Elementary Teachers* and *Earth Day in the Classroom: Mathematics and Science Materials and Resources for Teachers.*

How to Connect to ENC's Online Services

Educators with an interest in *Focus* topics will find other resources in the online *Catalog of Curriculum Resources.* New records are being added to ENC's catalog daily, so teachers who enjoyed an issue of *Focus* should consult the catalog for newer resources on the same topics. Also, ENC's Gopher and World Wide Web sites provide additional resources and links to other mathematics and science education sites.

To connect to ENC via the Internet, telnet or gopher to enc.org; via modem dial (800) 362-4448 or (614) 292-9040. Set your communication software to VT100 terminal emulation, no parity, 8 data bits, 1 stop bit, and full duplex. Once the connection is achieved, press <RETURN> to bring up a screen and type c to connect. All the information you need to use ENC's online service is on the screen. ENC's World Wide Web address is: http://www.enc.org.

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About *ENC Focus*...

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Introduction: Real Data Resources for Teachers

Have you ever had your students determine which kind of ice cream they like best? determine which paper towel is the most durable? determine how quickly coffee cools? determine which antacid neutralizes the most acid? As students solve these kinds of problems, they collect and analyze data that are meaningful to them. Students make estimates, search for patterns and relationships, count, take measurements, graph, and communicate results, thereby broadening their views of mathematics. At the same time, students are conjecturing, questioning, observing, and synthesizing which helps them understand the connections between science, math, and the real world.

The National Council of Teachers of Mathematics (NCTM), Project 2061 (AAAS), and the National Science Education Standards (draft) recommend that students in grades K to 12 collect and analyze actual data collected by themselves and others. According to these documents and organizations, mathematics and science literacy have become essential to a society based on technology and communication. The collection and analysis of actual (or real) data provides one avenue through which students can increase their science and mathematics literacy.

Real Data Resources

The resources chosen for this *ENC Focus* incorporate principles about data reflected in the math and science reform movements. For instance, the *Kids Network* materials encourage students to communicate with other students electronically about the water cycle and water pollution issues and to conduct water quality testing incorporating real data. Students use computers to record information, write letters, make graphs, and generate maps. In *GeoWorld*, a computer simulation, students collect data, record and analyze information, and make decisions in their roles as leaders of a geological expedition. Students perform geological tests and make mining decisions while learning about the distribution of resources in the world. Similarly, mathematics resources include *The Graph Club with Fizz & Martina,* a multimedia kit designed to assist children in making the transition from graphing with manipulatives to graphing in the abstract. As a detailed example of how some activities are designed, consider an activity from the NCTM *Addenda Series*. A table lists the winning times for the women's 400-meter freestyle swim for the Olympics, 1924-1984. Students are asked to plot the data points, construct a best-fit line, determine the meaning of the slope, write the equation of the line, use the line to make predictions, and determine the reasonableness of their solutions.

This catalog can only cover a small portion of the materials cataloged by ENC that may be useful in using real data in the classroom. You may wish to explore the possibilities available to you through ENC's online services.

Search Strategies

Resources were selected from ENC's *Catalog of Curriculum Resources.* If you have access to our online services (see *How to Connect to ENC* on p.1), you may use some of the same searching techniques we used to assemble this catalog. You can search the ENC *Catalog* using a variety of fields, such as cost, grade level, subject matter, or author.

We selected our related resources for each page by looking for particular keywords and by limiting searches. We began our searches with the broadest possible terms and then moved to more specific terms. For *Real Data*, we searched on subject terms that have the word "data" in them: data analysis, data interpretation, and data collection. Each of these terms has a distinct meaning, but in most cases they indicate that the students are actively involved in data examination of some kind. Such terms as "graphing," "measurement," and "probability" were other indicators that a resource might be useful for this topic.

Limiting searches is another easy way to find resources that are useful for your classroom. For example, one of our featured resources in this *Focus* is about measurement. We chose to highlight objects used for measuring, so we limited our search in resource type by the word "objects." Another useful way to find related items is to look at other items in a series. An example from this catalog is the NCTM *Addenda Series*. Although we only featured one of the series, our related resources name another resource from the same series.

This catalog is organized alphabetically by title. Each page in the main section of the catalog provides an abstract of a particular resource you may choose to explore. At the top of the page, you will see the suggested grade level for that resource, ordering and price information, and subject identifiers. At the bottom of each page, you will find listings of materials related to the main item, including materials from the same series or items that are the same resource type, such as videos or software. The chart on the following page displays features of the resources for which abstracts are provided.

Real Data Resources for Teachers

Overview of Contents

Title	Grade Level	Subject	Cost
Data Analysis and Statistics Across the Curriculum		Math	15.00
Developing Graph Comprehension		Math	11.50
Earth and Space Sciences		Science	34.95
Exploring Data		Math	23.45
First Grade Book		Math	9.50
GeoWorld: A Living Database		Science	79.95
The Graph Club of Fizz and Martina		Math	149.95
Internet Activities Using Scientific Data		Science	9.00
Kids Are Consumers, Too!		Math	25.95
Linear Correlation Study		Integrated	2.00
Math + Science: A Solution		Integrated	14.95
Measurement		Science	188.00
Measuring: From Paces to Feet		Math	12.95
Organizing Data and Understanding Uncertainty		Math	10.00
Patterns and Prediction		Science	511.90
Rock and Roll Physics		Science	34.95
Statistics Workshop		Math	129.00
Using Charts, Graphs, and Tables	9-12	Math	10.75
Variables	5-6	Science	319.00
What's In Our Water?	4-6	Science	375.00

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Data Analysis and Statistics Across the Curriculum

Grades 9-12

National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091-1593
Toll-free no.: (800) 235-7566
1 text: $15.00

Subjects: Data analysis; Data collection; Data interpretation; Graphing; Mathematics; Probability; Real data; Statistics.

1992

ENC-000666

Abstract: Written by classroom teachers, mathematics supervisors, and university mathematics educators, this is part of the *Addenda Series, Grades 9 to 12*. The *Addenda Series* was designed to provide instructional ideas and materials that support implementation of the Standards in local settings. In this volume, examples and activities are provided that illustrate: how data analysis and statistical thinking can be integrated into the standard high school mathematics curriculum; how data analysis and statistics can be integrated with the algebra, functions, and geometry strands of the Standards; and how links can be made between statistics, real world contexts, and other school subjects. Problem situations and tasks that involve students in designing experiments, collecting and organizing data, representing the data with visual displays and summary statistics, analyzing the data, communicating the results, and (where appropriate) searching for prediction models are described. A Try This feature provides additional exercises, problems, and explorations for use with students. More extensive investigations and problems appear as blackline masters at the end of each chapter. These activities are appropriate for students at varied levels, and solutions and comments are provided. Margin notes supply instructional suggestions, identify possible student misconceptions, and provide suggestions for assessment techniques as well as ideas for test items. Ideas and resources for student projects along with methods for evaluating student projects are provided, including samples of actual student work. Additional sources of ideas and materials are identified in a selective annotated bibliography at the end of the volume. (AM)

Author: Gail Burrill, John C. Burrill, Pamela Coffield, Gretchen Davis, Jan de Lange, Diann Resnick, Murray Siegel

Standards: NCTM standards (1989) — Content standards: General, K-12. — Mathematics as problem solving; Mathematics as communication; Mathematics as reasoning; Mathematical connections.

NCTM standards (1989) — Content standards: Grades 9-12. — Algebra; Conceptual underpinnings of calculus; Discrete mathematics; Functions; Geometry from a synthetic perspective; Geometry from an algebraic perspective; Mathematical structure; Probability; Statistics; Trigonometry.

The NCTM *Addenda Series, Grades 9-12* features other topics for high school mathematics classrooms.

Geometry From Multiple Perspectives
This volume links the content proposed by the Standards for geometry to that of current programs. Methods are described for incorporating real-world applications, modeling, and investigations (often technology-based) that lead to student-generated theorems. The volume provides suggestions for assessment techniques and test items, and alternative ways of assessing reasoning and proof making.

Algebra in a Technological World
This volume describes and illustrates with specific examples how school algebra can be organized naturally around the concepts of functions, families of functions, and mathematical modeling. Included is an overview of how technological tools such as graphing calculators and computer-algebra systems support new conceptions of algebra that focus on enabling students to explore, describe, and explain quantitative relations in their world.

Developing Graph Comprehension

Grades K-8

National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091-1593
Toll-free no.: (800) 235-7566
1 text: $11.50

Subjects: Data analysis; Data collection; Data interpretation; Graphing; Mathematics; Real data.

1989

ENC-001547

Abstract: Designed for grades K to 8, this book contains activities that teach students how to interpret, construct, and write about traditional graphing formats (such as bar, circle, picture, and line graphs) and new graphing techniques (such as box, line, and stem and leaf plots). The book includes 25 activities that were designed for immediate classroom use. These activities, which support the NCTM Standards (1989), can be used with students in both small and large group instruction. Supplementary materials are given in the appendices. These materials include instructions for constructing reusable aides for teaching graphing skills, different sizes of graph paper, samples of data collection sheets, and supplemental graph reading exercises. This book is intended to provide elementary and middle school teachers and teacher educators with practical ideas on incorporating the graph reading component of quantitative literacy into the instructional program. It can be used to supplement the teachers' editions of K to 8 textbooks, or as an elementary methods text for preservice and inservice teachers. (AM)

Author: Frances R. Curcio

Standards: NCTM standards (1989). — Content standards: General, K-12. —Mathematics as reasoning; Mathematics as communication.

NCTM, as well as other educational organizations and associations, has produced several professional development materials. Listed below are some resources for preservice and inservice teachers.

Teaching Mathematics with Calculators: A National Workshop
Mathematical Association of America, Washington, DC, Toll-free no.: (800) 880-9400
This videotape and guide include excerpts from a calculator-based discovery workshop for parents and children and excerpts from a talk show along with an outline and accompanying materials for developing and presenting a calculator-based discovery workshop. The workshop and talk show were designed to help parents understand how the regular, appropriate use of calculators in mathematics instruction can help empower students.

Algebra for Everyone
National Council of Teachers of Mathematics, Reston, VA, Toll-free no.: (800) 235-7566
This videotape and accompanying booklet provide teachers with models of instruction in algebra appropriate for students at all academic levels that incorporate the use of manipulatives in the development of algebraic concepts; cooperative groups; and use of graphing calculators in problem solving. The videotape shows excerpts of lessons taught by a mathematics teacher in an ordinary classroom and is designed to serve as a catalyst for discussion on needed changes in instructional methods, student behavior, and mathematical content.

Changing Practice: Teaching Mathematics for Understanding
National Center for Research on Teacher Learning, Michigan State University, East Lansing, MI,
Telephone no.: (517) 355-9302
This videotape and professional development guide contain illustrations of mathematics teaching that are consistent with suggestions from the National Council of Teachers of Mathematics Standards documents. The video and guide are designed to raise questions and stimulate conversations among educators and to assist teachers as they try alternative approaches to conventional practice. The tape shows segments from classroom lessons, including: a task is used to introduce a unit on fractions to third graders, and seventh graders' conceptual understanding of decimal numbers is developed.

Earth and Space Sciences

Grades 4-12

Office of Technology Liaison
University of Maryland
4312 Knox Road
College Park, MD 20742
Telephone no.: (301) 405-4209
1 3-disk set: $34.95

Subjects: Astronomy; Atoms; Comets; Data analysis; Data interpretation; Earth (Planet); Earthquakes; Erosion; Floods; Geology; Gravity (Physics); Molecules; Moon; Real data; Remote sensing; Science; Sea floor; Solar system; Topography; Vegetation; Antarctica; Pacific Ocean.

1993

ENC-000327

Abstract: This computer program consists of three CD-ROMs produced by the Joint Education Initiative Project (JEI, formerly JEdI) to incorporate real scientific data into science teaching for grades 4-12. The datasets in the CD-ROMs are from the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS). Eleven activities designed by scientists and teachers are included: students develop a general physiographic province map of North America using information found on the color coded elevation maps; Galveston Bay is analyzed for the impact sea level fluctuations have on human activities; students use visible light, reflected infrared, and thermal infrared energy spectrums to obtain the photosynthetic activity on the Earth; students analyze information about two different gravity models (the Bouguer gravity anomaly and the isostatic residual gravity anomaly); students analyze variations in global ozone levels and describe how those levels have changed over a ten-year period; students study the principle of first motion with respect to fault orientation and earthquake focus and relate seismic activity to the model of plate tectonics; students investigate the major properties in the Pacific Ocean; students use spectral images of comets (Halley and Giacobini-Zinner) and compare these images with known elements and compounds; students study the dynamic nature of Antarctica including coastline changes and seasonal fluctuations in sea ice concentrations; students take turns performing image enhancements of the selected Voyager images, analyzing the results, and presenting their technique and results to the entire class; and students discover that the sea floor is not all flat, sandy, and featureless as they study features such as meandering channels and escarpments. Each activity includes an introduction, major concepts, science processes, disciplines, grade level, objectives, needed materials, and directions for accessing the data files. (CCC)

Author: Joint Education Initiative, University of Maryland

Equipment: System requirements, IBM-PC or compatible: 80286 or higher, hard drive, 640 RAM; CD-ROM drive with appropriate driver software, VGA display, MS-DOS 3.1 or higher, Microsoft Extensions version 2.0 or higher. — Macintosh: Color graphics display, CD-ROM drive with appropriate driver software, 2 MB RAM minimum, 4 MB RAM recommended, system 6.0.5 or higher, HyperCard 2.0 or higher.

NASA has several series of videotapes that show and describe their data-gathering equipment; those videotapes often include teacher's guides with student activities.

Making Sense of Data
NASA CORE/Lorain County JVS, Oberlin, OH (216) 774-1051
This video series relates Hubble Space Telescope discoveries and science concepts to provide students in grades 6 to 10 with insights into the size, formation, and composition of the universe. This program introduces students to the scientific need for an accurate system to record and communicate data.

TOPEX/Poseidon: A Mission to Planet Earth
This NASA video for grades 9 to 12 explains the objectives of TOPEX/Poseidon, a joint mission by the United States and France to study the circulation of Earth's oceans. The video covers the topics of how ocean currents are produced, the advantages of remote sensing as opposed to traditional spot methods of measurement, and planned uses of the data obtained from the mission.

Exploring Data

Grades 7-12

Dale Seymour Publications
P.O. Box 10888
Palo Alto, CA 94303
Toll-free no.: (800) 872-1100
1 teacher's edition: $12.95
1 student edition: $10.50

Subjects: Data analysis; Data collection; Data interpretation; Graphing; Mathematics; Real data; Statistics.

1987

ENC-001549

Abstract: This book is part of the *Quantitative Literacy* series that introduces topics in statistics into elementary and secondary curricula. This teacher resource supplements the student edition which serves as an introduction to data analysis. The major goal of the student edition is to help students learn how to interpret data by using various kinds of plots and graphs. Students are directed to look at data the way a good statistician does: determine whether the data are reliable, display the data in appropriate plots, and examine the plots to try to make sense of the data. Each section of the student edition consists of introductory material followed by various applications which use real data. The applications are designed for students to work on either individually or in small groups. The topics for the data were chosen specifically to interest students and include: top rock albums and songs; nutritional values of many fast foods; number of gallons of soft drinks sold per person per U.S. state; favorite brands of ice cream; television ratings; salaries of many occupations; box office hits; home run champions; birth month distribution; and presidential election results. This teacher's edition contains notes on teaching and answers to the discussion questions. Reduced student pages are included along with the notes and answers. (Author/VN)

Author: James M. Landwehr, Ann E. Watkins

Evaluation: Research study: Day, Roger P. et. al. *Evaluation of Quantitative Literacy Series: Exploring Data and Exploring Probability.* Program Report 87-5. Wisconsin Center for Education Research, Madison, WI, 1987.

Below are more mathematics resources designed to interest students in the data they study.

Exploring Probability
Claire M. Newman, Thomas E. Obremski, Richard L. Schaeffer
Dale Seymour Publications
This book is one of a series that introduces topics in statistics into elementary and secondary curricula. Students learn the relative frequency concept of probability; how to estimate probabilities from real data; the relationship between estimated and theoretical probability; how to find and use expected values; when to multiply and add probabilities; how to use randomness in sampling; and how to explain outcomes of experiments in terms of probability, odds, and expected values. The activities in the book use manipulatives and real data, some of which are student generated. The topics for the data are chosen specifically to interest students and cover a wide variety of fields.

Sports Math
Don Fraser
Dale Seymour Publications
This booklet of 400 math problems based on real sports statistics from a wide range of sports is designed as an instructional unit with math enrichment worksheets for students of all ages. The booklet consists of 38 blackline masters, a skills and interests chart, answer sheets, and a scoreboard sheet. The skills and interests chart lists the sport activity on each blackline master and the math skills required to solve problems. The chart is structured to provide practice in addition, subtraction, multiplication by one- and two-digit numbers, averages and division with whole numbers and decimals, time with addition and subtraction, graphing, collecting and organizing data, reading a chart, problem solving, and percent.

First Grade Book:
NCTM Addenda Series, Grades K-6

Grade 1

National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091-1593
Toll-free no.: (800) 235-7566
1 text: $9.50

Subjects: Arithmetic; Classification; Data analysis; Data collection; Estimation; Geometry; Graphing; Mathematics; Measurement; Number concepts; Numbers; Patterns (Mathematics); Plane geometry; Real data; Shapes; Spatial representations.

1991

ENC-000552

Abstract: Written by classroom teachers, mathematics supervisors, and university mathematics educators, this is the first grade book of the NCTM Curriculum and Evaluation Standards for School Mathematics *Addenda Series, Grades K-6.* The series is designed to illustrate the Standards and to help teachers translate them into classroom practice through sample lessons and discussions that focus on the development of concepts; activities that connect models and manipulatives with concepts and with mathematical representations; problems that exemplify the use and integration of technology; teaching strategies that promote students' reasoning; approaches to evaluate students' progress; and techniques to improve instruction. The themes of problem solving, reasoning, communication, and mathematical connections are woven throughout the materials, as is the view of assessment as a means of guiding instruction. In this booklet, traditional and new topics are explored in four areas: patterns, number sense and operations, making sense of data, and geometry and spatial sense. Traditional first grade activities are given an investigative flavor. These activities include classifying patterns, exploring number patterns, representing numbers in various ways, estimating, organizing data, measuring, and investigating geometry in the environment. There is also a variety of problems and questions to explore with students. Margin notes give teachers additional information on activities and on additional topics such as student self-confidence, evaluation, and grouping. Supporting statements from the *Curriculum and Evaluation Standards for School Mathematics* also appear in the margin notes. Connections to other curricular areas are made throughout the booklet. Activities have been field tested by teachers to ensure that they reflect the realities of classrooms. (AM)

Author: Grace Burton, Douglas Clements, Terrence Coburn, John Del Grande, John Firkins, Jeane Joyner, Miriam A. Leiva, Mary M. Lindquist, Lorna Morrow

Standards: NCTM standards (1989) — Content standards: General, K-12. — Mathematics as problem solving; Mathematics as communication; Mathematics as reasoning; Mathematical connections.

NCTM standards (1989) — Content standards: Grades K-4. — Concepts of whole number operations; Estimation; Fractions and decimals; Geometry and spatial sense; Measurement; Number sense and numeration; Patterns and relationships; Statistics and probability; Whole number computation.

This *Addenda Series* by NCTM includes a volume for each grade, K-6. All assist the teacher in implementing the Standards in elementary classrooms.

Fifth Grade Book
In this booklet, traditional and new topics are explored in four areas: patterns, number sense and operations, making sense of data, and geometry and spatial sense. These activities include investigating tessellations and similarity with manipulatives and with the computer; setting the foundation for algebra by introducing the concept of variables with manipulatives and pictures; studying patterns to determine the rule for the nth term in a sequence of arrangements; conducting experiments in measurement and estimation with large numbers; extending estimation and computation activities to include decimals; making decisions by interpreting data gathered by students; and making connections to history and the study of other cultures through the use of patterns.

GeoWorld: A Living Database

Grades 5-12

Tom Snyder Productions, Inc.
80 Coolidge Hill Road
Watertown, MA 02172-2817
Toll-free no.: (800) 342-0236
1 set: $79.95

Subjects: Data analysis; Data interpretation; Earth science; Fossil fuels; Geography; Geology; Maps; Metals; Minerals; Mining; Natural resources; Real data; Rocks; Science; Social studies.

1986

ENC-000387

Abstract: This computer simulation engages middle and high school students in reading maps and charts, recording and analyzing information, and making decisions in their roles as leaders of a geological expedition. Students perform a variety of geological tests and make mining decisions while learning about the distribution of resources in the world. *GeoWorld* can be integrated into earth science, social studies, and geography curricula and can be used to increase critical thinking and problem solving skills. Students search the world for 15 major resources: 13 minerals and two fossil fuels. Students begin by selecting an area of the world to explore. They can perform three geological tests to help them decide which locations are most likely to contain the resource. The results of each kind of test are presented differently as charts or diagrams. By interpreting these results, students can determine which areas should be further examined. When they have gathered strong evidence of a resource, they are able to test their research by mining. A record is kept of the students' findings which can be displayed on the screen or printed out. The simulation can be conducted either as a game for which the goal is to find as much of the resource as possible before running out of money or as a tool for researching the distribution of resources. The computer software is accompanied by a teacher's manual that provides suggestions for using *GeoWorld* and includes technical directions, lesson plans, and reproducible student worksheets. Four lesson plans incorporate the simulation either in the game or research version. The lesson plans involve the use of worksheets provided in the manual and contain activity set-up instructions, discussion questions, and ideas for additional activities. *GeoWorld* can be used with AppleWorks to introduce students to databases and word processing. (LZ)

Author: Designed by Steven Fried and Thomas F. F. Snyder; programmer, Steven Fried; program graphics, Patricia Hunter and Annette Donnelly

Equipment: System requirements: Apple II series, 64K RAM, 5 1/4 in. disk drive.

Other resources which integrate social studies and science are available in the ENC *Catalog of Curriculum Resources*.

Selected Packets of Geological Teaching Aids
Geologic Inquiries Group / United States Geological Survey, Reston, VA, Telephone no.: (703) 648-4383
This resource packet was prepared for elementary and high school teachers of general science, geography, social studies, environmental education, and other earth science related subjects. The leaflets, pamphlets, and booklets contained in the packet provide information on identifying and collecting various types of rock samples; how maps portray the geologic features of the Earth; the geological features of caves; the hydrologic cycle; interior Earth structures such as the crust, mantle, and core and a comparison with the Moon's interior structures; and the 24 physiographic regions and provinces of the United States.

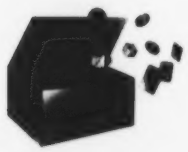
Amazing Facts and Real Problems : Solving Problems Using Real Life Information. Decks I and II.
Carole Greenes et al.
Creative Publications, Oak Lawn, IL, Toll-free no.: (800) 624-0822
These sets of cards, developed for grades 5 to 8, are a collection of reading and mathematics experiences that challenge students to use mathematics to solve real life problems. Topics come from the physical and natural sciences; history, government, and geography; architecture; the fine arts; entertainment; and sports. There is a paragraph of information about each topic which is then followed by a challenge problem. To solve the problem, students must obtain data from the paragraph and decide upon a solution strategy.

The Graph Club of Fizz and Martina

Grades K-4

Tom Snyder Productions, Inc.
80 Coolidge Hill Road
Watertown, MA 02172-2817
Toll-free no.: (800) 342-0236
1 kit: $149.95

Subjects: Computation; Data analysis; Data collection; Data interpretation; Fractions; Graphing; Mathematics; Patterns (Mathematics); Percentage; Problem solving; Real data.



1993

ENC-000585

Abstract: Designed for grades K to 4, this multimedia kit includes software, a children's book, 28 student portfolios with seven sets of four portfolios each, an activities guide, and a teacher's guide. The materials are designed to assist children in making the transition from graphing with manipulatives to graphing in the abstract and to help them understand the relationships between different representations of the same data, e.g., picture graph, bar graph, line graph, circle graph, and table. Several skills are developed: counting, adding, subtracting, comparing, generating questions, determining what information is needed to answer a question, discovering patterns, reading, writing, listening, speaking, and problem solving. Teachers read from the children's book and students then work in groups of four in their student portfolios to conduct research and to solve problems presented in the story. Each member of the group is given a different student portfolio with unique and essential information, ensuring group cooperation. Student portfolios include 20 multi-day lessons and are divided into five sections. Each section introduces a new type of graph, and each activity within the set involves a different kind of data collection and analysis activity. As they work through the sequenced activities, students collect information from class surveys, interviews, reading, and other research. Students then use the computer to create and analyze graphs using data generated in the student portfolios. The activities guide includes reduced versions of the student portfolio pages along with complete lesson[illegible] incorporating the activities into the curriculum. The teacher's guide includes introductory material, suggestions for classroom use, guidelines for teaching graphing in the primary grades, suggestions for authentic assessment, reproducible masters, and a list of teacher and student resources. The student portfolios and teacher's guide are designed to encourage math tie-ins with science, social studies, health, language arts, and other curricular areas. Most of the activities are designed for team work and whole class instruction, but many can be completed by individual students or pairs. Although the package was designed for grades K to 4, the program can be used at the upper elementary and middle school levels. (AM)

Author: Peggy Healy Sterns

Standards: NCTM standards (1989)

Evaluation: Citations:

"1994-95 Software awards; the top 6." *Technology & Learning*. November/December 1994, Vol.15, No. 3, pp. 21-22.

Eiser, Leslie. "Math for a Reason: Math Education Programs that Comply with the National Council of Teachers of Mathematics Standards." *Technology & Learning*. March 1993, Vol. 13, No. 6, pp. 52-55, 58.

Kosuth, Paul R. [Brehm Preparatory School, Carbondale, IL]. "Reviewing and Viewing: Etcetera." *Teaching Children Mathematics*. September 1994, Vol. 1, No. 1, p. 48.

Levinson, Rita. "The Graph Club: Tom Snyder Production Inc.'s Educational Software Teaches Math and Graphing Concepts." *Technology & Learning*. April 1994, Vol. 14, No. 7, p. 10, 12.

Lindroth, Linda K. "Lights, Action, Math! Putting the NCTM Standards on Screen." *Electronic Learning*. April 1994, Vol. 13, No. 7, p. 42.

Equipment: System requirements: Macintosh with color monitor; system 6.0.7 and higher; 1 MB of available RAM.

Fizz and Martina appear in several different kits, including *Blue Falls High*, *Project Sphinx*, *Hollywood*, and *Buddies for Life*.

Internet Activities Using Scientific Data

Grades 6-12

Space Environment Lab,
National Oceanic and
Atmospheric Administration
325 Broadway, R/E/SE
Boulder, CO 80303
Telephone no.: (303) 497-3992
1 text: $9.00

Subjects: Atmosphere; Computer use; Computer uses in education; Data analysis; Data interpretation; Internet; Earth science; Earthquakes; Geology; Greenhouse gases; Land use; Real data; Science; Space sciences; Sun; Sunspots; Technology; Weather; Wind (Meteorology).

1995

ENC-001430

Abstract: This guide, developed for grades 6 to 12, provides exercises that enable students to access and analyze current online information from the National Oceanic and Atmospheric Administration (NOAA) and other providers, using common Internet software tools. Software tools include electronic mail, ftp, Gopher, telnet, Mosaic, Geo Vu, and spreadsheets. The online datasets are varied and cover the following topics: seismic activity, current and forecasted weather, sunspot activity and HF radio propagation forecasts, land use patterns, high altitude winds, and concentration of greenhouse gases. Also referenced in this guide are data from the U.S. Geological Survey (USGS), the National Aeronautics and Space Administration (NASA), the National Center for Atmospheric Research (NCAR), and several universities. The activities pose questions with several levels of difficulty. The text includes suggestions for extended investigations using the data and tools. Users should have basic skills with computer hardware and software and must have access to an Internet connection. Instructions for setting up electronic mail and Internet connections using various computers are also included. (Author/KSR)

Author: Stan Froseth, Barbara Poppe

Publisher: Washington, DC: United States Department of Commerce, National Oceanic and Atmospheric Administration, Office of Educational Affairs, Space Environment Laboratory

ENC has begun to catalog Internet sites so that educators will be better informed about the hundreds of mathematics and science education online resources. See also page 24 for Internet sites which support real data study.

National Oceanographic Data Center (NODC) home page
Online addresses: http://www.nodc.noaa.gov/
gopher://ariel.nodc.noaa.gov/
The National Oceanographic Data Center (NODC) is one of the environmental data centers operated by the National Oceanic and Atmospheric Administration (NOAA). The NODC provides ocean data management and ocean data services to researchers and other users in the United States and around the world.

Electronic Universe Project
Online address: http://zebu.uoregon.edu/contents.html
The Electronic Universe Project assembles archives of information centered around astronomy and environmental resources so that middle and high school science teachers can personalize courseware around these resources. The project is in initial startup phase and predicts rapid growth.

JASON Project home page
Online address: http://seawifs.gsfc.nasa.gov/scripts/JASON.html
The JASON Project was founded in 1989 by Dr. Robert D. Ballard. Each year, a two-week scientific expedition is mounted in a remote part of the world and broadcast in real time, using state of the art technology, to a network of educational, research, and cultural institutions in the United States, Canada, Bermuda, and the United Kingdom. The Project provides teacher training and a curriculum specially designed to highlight science, technology, engineering, and social studies of the year's expedition. JASON online systems, one of eight educational components of the Project, integrate a variety of Internet-based applications including Mosaic, Gopher, newsgroups, and electronic mail to provide teachers and students with additional resources related to the expedition.

Kids Are Consumers, Too!

Grades 3-8

Dale Seymour Publications
P.O. Box 10888
Palo Alto, CA 84303
Toll-free no.: (800) 872-1100
1 text: $25.95

Subjects: Arithmetic; Computation; Data analysis; Data collection; Data interpretation; Estimation; Geometry; Graphing; Mathematics; Problem solving; Process skills; Real data; Statistics.

1986

ENC-001548

Abstract: Intended for instructors of grades 3 to 8, this book suggests activities which allow students to learn a variety of math skills in real world problem solving situations. Each activity has a suggested range of grade levels. Skills covered in this book include collecting, classifying, and interpreting data; arithmetic; averaging; decimals and fractions; geometry; graphing; measurement; estimation; and number skills. Math activities are organized into two main categories: skill areas (charts and graphs, geometry, and measurement) and real world applications (earning and banking, shopping, eating, and traveling). The activity chapters feature introductory suggestions, actual activities and suggestions for extensions, and ideas for related short activities. The last three chapters offer comprehensive projects, tips for teachers, and suggestions for materials and resources. (Author/DDD)

Author: Jan Fair, Mary Melvin

Evaluation: Citation: Blanton, F. Lamar. *Curriculum Review*. March/April 1986, Vol. 25, p. 56.

Using money in different problems and situations is often an effective way for students to understand math principles.

Fizz & Martina's Little Shoppers' Kit
Designed by Liz Della Paolera, Phyllis Kalowski, and Tom Snyder
Tom Snyder Productions, Inc., Watertown, MA, Toll-free no.: (800) 342-0236
Designed for grades K to 4, this kit involves students in simulating the creation and running of a store in the classroom. The kit reinforces the following math skills: numeration, computation, and decimals. Activities also promote computer literacy.

The Big Splash
Learning Technology Center, Peabody College, Vanderbilt University
Optical Data Corporation, Warren, NJ, Toll-free no.: (800) 524-2481
The Adventures of Jasper Woodbury series is produced in accordance with the National Council of Teachers of Mathematics (NCTM) Standards. Each episode in the series contains a teacher's manual, student materials, a videodisc, and optional computer software. This episode in the series involves a story about a student who wants to help his school raise money to buy a new camera for the school television station. The overall problem centers on developing a business plan for a school fair, including the use of a statistical survey to decide if the idea would be profitable. First, students find the best ticket price from a survey and extrapolate the sample to the school population to estimate the revenue. They then estimate the expenses of the fair; the plan can only be approved if the revenue collected equals at least twice the expenses, and the expenses are less than or equal to $150.

Maneuvers with Nickels and Numbers
David A. Page, Philip Wagreich, Kathryn Chval
Dale Seymour Publications, Palo Alto, CA, Toll-free no.: (800) 872-1100
Designed for grades 5 to 8, this teacher sourcebook and student lab book emphasize the use of full function calculators as a problem solving tool; use a hands-on approach; and cover a variety of topics including area, surface area, volume, measurement, money, and graphs.

Linear Correlation Study:
The Integration of Mathematics and Biology

Grades 8-10

Mathematics Department
University of Southern
Mississippi
Box 5045
Hattiesburg, MS 39406
Telephone no.: (601) 266-5784
1 text: $2.00

Subjects: Biological sciences; Biology; Data analysis; Data collection; Data interpretation; Golden rectangles; Graphing; Graphing calculators; Heart rate; Integrated curriculum; Human body systems; Linear relationships; Mathematics; Plant growth; Real data; Science.

1994

ENC-001587

Abstract: This set of graphing activities, developed for grades 8 to 10, allows students to gather biological data, analyze the data mathematically, render biological explanations, and use mathematical models to make predictions. Students use graphing calculators to determine if there is a linear relationship between the length and width of golden rectangles of varying dimensions and between sets of data that show positive, negative, or no correlation. Activity topics include the relationship between heart rate and age, the height of corn seedlings and the number of days since planting, lung capacity and height, and the amount of carbon dioxide given off by yeast grown in various concentrations of sucrose. The activities were developed based on the NCTM Standards and the National Science Education Standards (draft). In addition to the activities, twelve statements are provided, and students are asked to match each sentence to an appropriate graph, e.g. you are watching an exciting movie; plot your heart rate (beats per minute) as a function of time. (VN/KSR)

Author: Lida G. McDowell

Standards: NCTM Standards (1989).
National Research Council. Draft, National Science Education Standards (November 1994).

Increasingly, more materials are being developed which integrate science and mathematics. Featured below is part of a series of integrated materials useful in the study of real data.

These modules, developed for middle school students, weave important mathematics themes into relevant science topics and are based on the current reform agendas of NCTM and Project 2061 (AAAS). The series, Real-World Mathematics Through Science, is available through the Addison-Wesley Publishing Company, Toll-free no.: (800) 552-2259.

Investigating Apples
Christine V. Johnson
These activities provide students with experiences collecting, organizing, representing, and interpreting data. The content, developed around the statistics used in the apple-growing industry, incorporates pomology and the careers of horticulturists, food scientists, and statisticians.

In the Air
Christine V. Johnson
This module provides a sampling of activities and navigational techniques to explore while introducing students to the career possibilities in piloting. This emphasizes the mathematical connections for charting a cross-country journey in a Cessna 172.

In the Pharmacy
Nancy Cook
In learning about the work of a pharmacist, students make the connections between ratios, proportions, percents, mixtures, and dilutions. Students learn about pharmacists' daily work and how mathematics is an important part of their jobs.

Math + Science: A Solution

Grades 5-9

AIMS Education Foundation
P.O. Box 8120
Fresno, CA 93747-8120
Telephone no.: (209) 255-4094
1 text: $14.95

Subjects: Averaging; Chemistry; Computation; Data analysis; Data collection; Data interpretation; Economics; Equations; Graphing; Logic; Mathematics; Metric system; Percentage; Problem solving; Process skills; Real data; Science; Statistics; Temperature; Volume (Mathematics).

1987

ENC-000083

Abstract: Activities Integrating Mathematics and Science (AIMS) books primarily integrate mathematics and science, but also provide coordinating activities related to other curriculum areas including language arts, social studies, physical education, art, and music. This book includes 27 lesson plans designed to engage students in grades 5 to 9 in activities or investigations that integrate mathematics and science. Each activity generally includes: topic area, introductory statement, key question, math skills and science processes, materials, background information, management, advanced preparation, procedure, discussion, extensions, curriculum coordinates, and illustrated student worksheets. Topic areas include: observation; classification; chemical changes; estimating and measuring in metric units; gathering data; recording data; interpreting data; controlling variables; measuring temperature; measuring volume; estimating and measuring mass; searching for a representation of a million; graphing; statistics; economics; applying; generalizing; and sampling. Lessons include: hands-on, discovery, and cooperative group activities. Math skills include: averaging; counting; decimals; equations; formula usage; logic; percent; problem solving; ratios; and whole number computation. Science processes include: observing; classifying; measuring; estimating; predicting; hypothesizing; controlling variables; gathering data; recording data; interpreting data; applying; and generalizing. (AM)

Author: authors, John Campopiano, Walt Laidlaw, Judith Hillen, Nancy Rice, John Kinnear, Karen Zahlis; editors, Larry Ecklund, Arthur Wiebe

Evaluation: Citations:

Berlin, Donna F. [National Center for Science Teaching and Learning] and Judith A. Hillen [AIMS Education Foundation]. "Making Connections in Math and Science: Identifying Student Outcomes." *School Science and Mathematics*. October 1994, Vol. 94, No. 6, pp. 283-290.

Deal, Debby [science consultant]. "A Look at Project Aims." *School Science and Mathematics*. January 1994, Vol. 94, No. 1, pp. 11-14.

Mizer, Robert, Robert W. Hower, and Patricia Blosser. *Mathematics: Promising and Exemplary Programs in Elementary and Secondary Schools*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1990. pp. 17-19. ED 335230.

The AIMS Series often involves students in using math and science process skills as they collect, record, and analyze data that is meaningful to them.

Floaters and Sinkers: Solutions for Math and Science

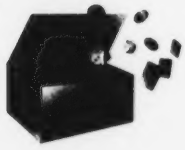
This activity book includes 26 activities designed for students in grades 5 to 8. Through a series of investigations, students measure volume; explore the idea of visible and invisible space between particles; discover the float line and relationship between surface area and cargo capacity of foil or clay boats; and explore the densities and volumes of wood, spherical objects, and irregularly shaped objects. The intended outcomes include: applying and generalizing; averaging; calculating; classifying; collecting and organizing data; computing; controlling variables; cubing a number; dividing; estimating; finding mass; finding percent; finding ratio; finding slope; finding volume; gathering data; graphing; interpreting data; massing; measuring; multiplying; observing; predicting; recording data; rounding off; subtracting; and using a Vernier caliper.

Measurement

Grades 4-7

SAVI/SELPH, Center for Multisensory Learning
Lawrence Hall of Science,
University of California
Berkeley, CA 94720
Telephone no.: (415) 642-8941
1 folio set (pamphlets): $6.00
1 kit : $188.00

Subjects: Celsius scale; Data analysis; Data collection; Length; Measurement; Metric system; Physics; Science; Temperature; Weight (Mass).



1982

ENC-000178

Abstract: Science Activities for the Visually Impaired and Science Enrichment for Learners with Physical Handicaps (SAVI/SELPH) is an interdisciplinary, multisensory science enrichment program designed for blind and visually impaired, orthopedically handicapped, learning disabled, developmentally disabled, emotionally handicapped, hearing impaired, and non-disabled students in grades 4 to 7. The program consists of three major components: printed activity instructions for the teacher; student equipment kits; and an educational philosophy for incorporating science into the curriculum of disabled students. This module explores measurement. Four activities are included. The First Straw teaches students about the need for standard units of measurement. They begin by using one drinking straw to measure length. Then students use this measurement technique to measure objects of various shapes and compare the sizes. Take Me to Your Liter teaches students to use liters and milliliters as units to determine the fluid capacity of some common containers. Weight Watching teaches students to use a balance with paper clips and gram weights to determine how much a metal washer weighs. They also discover that one milliliter of water weighs one gram. The Third Degree introduces students to the concept of temperature and to the use of the thermometer. They also experiment with mixing warm and cold water. A Follow-Up section after each activity provides an assessment activity to be conducted with each student individually. A matrix provides activity descriptions, science concepts, process skills, application skills, language development, and related learning resources for this module. (CCC)

Author: SAVI/SELPH, Center for Multisensory Learning, Lawrence Hall of Science, The University of California, Berkeley

Audience: Disabled students; Learning disabled students; Physically disabled students; Vision-impaired students.

Measurement activities often require equipment; below are a few measurement tools from the ENC *Catalog of Curriculum Resources*.

Square Stacking Mass Set
Ohaus Corporation, Florham Park, NJ, Toll-free no.: (800) 672-7722
This set of plastic, color-coded square (3 centimeter) stacking masses includes twenty 5-gram, ten 10-gram, and five 20-gram masses for a total of 300 grams. The set can be used as a teaching aid in metric mass measurement.

Portable Advanced Electronic Balance
This Model CT200-S portable electronic balance, with a weighing capacity of 200 grams and a readability of 0.01 grams, allows students to display weight values in several different weighing units as well as count parts by selecting an initial sample size from five to 50 parts. A kit is included that allows the balance to be interfaced directly to a computer or printer that uses a nine-pin connector.

Bow Caliper Assembly
This bow caliper and depth gauge can be used for measuring outside dimensions, inside dimensions, or depth. Each arm is graduated from 0 to 30 centimeters.

Immersion Thermometer
This thermometer ranges from -20 to 110 degrees Celsius and has one-degree divisions.

Measuring: From Paces to Feet

Grades 3-4

Activity Resources Company, Inc.
P.O. Box 4875
Hayward, CA 94540
Telephone no.: (510) 782-1300
1 text: $12.95

Subjects: Computation; Data analysis; Data collection; Data interpretation; Estimation; Graphing; Mathematics; Measurement; Problem solving; Real data; Statistics.

1990

ENC-000669

Abstract: This book is part of a six-unit series that engages students in grades K to 6 in the collection, recording, discussion, analysis, and interpretation of real-world data. This unit of study for grades 3 to 4 introduces measuring as a way of collecting data. Students investigate, first through their own physical movements and later with more standardized units; collect real data through measuring, using both informal and standard measurement systems; represent measurement data in a variety of ways; describe features of the data; and formulate hypotheses and build theories about the reality represented by the data. The investigations develop the following additional concepts and skills: comparing units of measurement, estimating distances and lengths, defining a measurement method, writing directions involving distances, understanding the need to standardize, and measuring accurately. Each investigation includes a summary of the student activity, a list of needed materials, a list of important mathematical ideas, step-by-step suggestions that outline the students' explorations and the teacher's role, dialogue boxes that illustrate the special role of discussion in these investigations and typical student and teacher interactions, and teacher notes. The unit also includes a general discussion of data analysis and pedagogical techniques (e.g., discussion, small group work, materials to represent data, calculators, computers, home and school connections, and interdisciplinary connections). Completion of the unit requires approximately 17 class sessions of about 45 minutes each. (AM)

Author: Rebecca B. Corwin and Susan Jo Russell

Publisher: Palo Alto, CA : Dale Seymour Publications

All volumes in this series, *Used Numbers: Real Data in the Classroom*, feature student-generated data activities for elementary students.

Statistics: The Shape of the Data
In this unit of study for grades 4 to 6, students collect real data through observation, experiments, and surveys; represent data with models, tables, graphs, and diagrams; describe features of the data; and formulate hypotheses and build theories about the reality represented by the data.

Counting: Ourselves and Our Families
In this unit of study for grades K to 1, students count themselves, other groups of students, objects in their classroom, parts of their body, and other immediate aspects of their environment; record and represent these counts using a variety of concrete materials, pictures, and graphs; and describe and compare their results. The investigations develop the following additional concepts and skills: one-to-one correspondence, associating the counting numbers with objects and quantities, comparing quantities, developing counting strategies, and counting above 20.

Statistics: Prediction and Sampling
In this unit of study for grades 5 to 6, students use data collected from samples to make predictions. Students develop sampling plans to collect real data from a population; represent collected data in a variety of ways; describe features of the data; reason about relationships between samples and populations; evaluate the representativeness of samples; and formulate hypotheses and build theories about the reality represented by the data.

Organizing Data and Understanding Uncertainty

Grades 5-8

National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091-1593
Toll-free no.: (800) 235-7566
1 text: $10.00

Subjects: Data analysis; Data collection; Data interpretation; Graphing; Mathematics; Probability; Process skills; Real data; Statistics.

1979

ENC-001370

Abstract: Designed for grades 5 to 8, this book contains two units that involve students in the collection, organization, analysis, and description of data. The units center around simple, basic concepts in probability and statistics. They are independent of one another and may be used with any mathematics program in the upper elementary or junior high school grades or in general mathematics classes. Each of the units contains a sequential development of ideas through a series of experiences; there are five experiences in each unit, with some requiring up to three days, and others only one day. The experiences are intended to provide opportunities for systematic thinking by requiring children to collect and organize data and to make predictions based on their data; practice in basic skills, including computation; and opportunities for children to observe, explore relationships, collect information, test hypotheses, and do independent investigations. The description of each experience includes an objective; a materials list; a strategy that may be employed by the teacher; reproductions of student activity worksheets; and a general suggestion about evaluation. (AM)

Author: National Council of Teachers of Mathematics

The series featured below also brings data analysis into the middle school classroom.

Middle Grades Mathematics Project
Addison-Wesley Publishing Company, Reading, MA, Toll-free no.: (800) 447-2226

Mouse and Elephant: Measuring Growth
Janet Shroyer, William Fitzgerald
Designed for grades 5 to 8, this teacher source book is part of a series of five books designed to help teachers develop students' problem solving skills via activity-oriented mathematics. In this book, concepts of area, perimeter, surface area, and volume are introduced with tiles, cubes, and story language. In this book, the unit challenge is designed to motivate students to answer two questions: given a mouse and an elephant of specified heights, how many mice does it take to balance the elephant, and how many mouse coats are needed to make a coat for the elephant?

Probability
Elizabeth Phillips, Glenda Lappan, Mary Jean Winter, William Fitzgerald
This book includes ten activities that involve introductory ideas in probability: fair games, equally likely outcomes, expected value, simulations, Pascal's Triangle, and the binomial distribution. In the activities in this book, students use manipulatives in experiments; they guess at the outcome of a situation and then test their conjectures by experimenting.

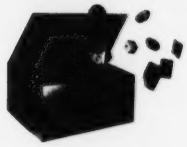
Similarity and Equivalent Fractions
Glenda Lappan, William Fitzgerald, Mary Jean Winter, Elizabeth Phillips
This book includes nine activities that develop students' understanding of similar figures and equivalent fractions through indirect measurement, scale models, and the nature of growth. In the activities, students enlarge figures using a coordinate system; use concrete materials to examine the relationship of the growth of area to the growth of lengths; develop quick visual tests for similar rectangles and triangles; and apply the ideas they have learned.

Patterns and Prediction

Grade 3

Kendall/Hunt Publishing Company
2460 Kerper Boulevard
P.O. Box 539
Dubuque, IA 52004-0539
Toll-free no.: (800) 228-0810
1 student text: $19.90
1 teacher's edition: $43.90
1 complete activity kit: $511.90

Subjects: Construction (Process); Data collection; Dental health; Design (Engineering); Health; Life cycle; Nutrition; Patterns (Mathematics); Prediction; Recordkeeping; Science; Technology.



1992

ENC-000452

Abstract: The Biological Science Curriculum Study (BSCS) Science for Life and Living program (grades K to 6) is organized around major concepts and skills that connect hands-on activities in science, technology, and health. The program uses a five-stage instructional model: engage, explore, explain, elaborate, and evaluate. The instructional model is based on a constructivist approach within a cooperative learning framework. For each grade level, the program includes a teacher's guide, a student text, a kit of hands-on materials for 30 students, and an implementation guide. This set is designed for grade 3. The major concept is patterns, and the major skill is prediction. The student text includes 29 lessons within four units. In unit one, students recognize and describe patterns of design and patterns shown by relationships. In unit two, students use patterns shown in data to make predictions, practice scientific recordkeeping, and organize data into bar graphs. In unit three, students learn that construction patterns and quality of work can affect the strength of a structure. In unit four, students explore the relationship between what people eat and their health, apply the nutritional guidelines for selecting foods for a healthy diet, and link nutrition to dental health. The student text includes procedural and expository text; team skills necessary for cooperative learning; tables; charts; diagrams; poems; short stories; cartoons; articles; and writing opportunities, including expository writing, recording in journals, creative writing, and displaying data in graphic form. The teacher's guide includes a program overview, lesson outcomes, teaching strategies, blackline masters, and an appendix that includes a list of recommended trade books. (TDB)

Author: BSCS Innovative Science Education

Evaluation: Field tested at the following schools: — Tempe, AZ. Kyrene del Sureno Elementary School; Kyrene de los Lagos Elementary School — Lompoc, CA. La Honda Elementary School; Ruth Elementary School — Oakland, CA. John Swett Elementary School — Colorado Springs, CO. Kathrine L. Bates Elementary School; Divine Redeemer Elementary School; Henry W. Longfellow Elementary School; Oak Creek Elementary School; Stratmoor Hills Elementary School; John G. Whittier Elementary School; Wildflower Elementary School — Denver, CO. Colorado Academy — Woodland Park, CO. Columbine Elementary School — Pueblo, CO. Hellbeck Elementary School — Fort Collins, CO. Shepardson Elementary School — Chicago, IL. Inter-American Magnet School; New Sabin School; St. Thomas of Canterbury School — Baltimore, MD. Cross Country Elementary School — Drayton Plains, MI. Grayson Elementary School — Pontiac, MI. Lutes Elementary School.

Several resources from the ENC *Catalog* stress the skill of prediction.

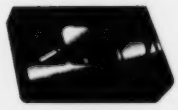
Spreadsheet Activities in Middle School Mathematics
John C. Russell, National Council of Teachers of Mathematics, Reston, VA, Telephone no.: (800) 235-7566
Designed for grades 4 to 8, this booklet and diskette include spreadsheet models and accompanying exercises that promote student thinking with numbers. The diskette requires the user to have the Better Working Spreadsheet. Students study various concepts, observe the displayed data resulting from their input in order to see patterns, and hone their prediction skills.

Rock and Roll Physics

Grades 6-12

NASA CORE/Lorain
County JVS
15181 Route 58 South
Oberlin, OH 44074
Telephone no.:(216) 774-1051
1 videocassette: $20.00
1 teacher's guide: $14.95

Subjects: Acceleration (Physics); Career awareness; Data analysis; Data collection; Data interpretation; Energy; Force; Gravity (Physics); Inertia; Momentum; Motion; Newton's laws of motion; Pendulums; Physics; Real data; Sciences; Scientists; Velocity; Waves (Water); Weightlessness; Work (Physics).
1992



ENC-001176

Abstract: This series of videos, developed for broadcast on PBS, focuses on the research of several new explorers who are on the cutting edge of scientific discovery, extending the frontiers of science, technology, nature, and environmental conservation. The goal of this series is to introduce students to science as a career possibility for their own lives. Each episode includes a teacher's guide which contains hands-on activities that can be done in the classroom or on a structured field trip that allow students to experience activities that parallel or complement those of the scientists in the video. In this episode, students learn physics while riding on roller coasters, on water rides in an amusement park, in a swimming pool, in the school's parking lot, and in the classroom. The activities in the teacher's guide, developed for grades 6 to 12, focus on Newton's laws, work and energy, weightlessness, momentum, circular motion, and waves. (Author/KSR)

Author: Kurtis Productions Inc.; WTTW, Chicago

Evaluation: Awards: Ohio State University Institute for Education by Radio-TV, April 1993.

The *New Explorers* Series features many videos useful for data analysis. The teacher's guides often involve students in activities similar to those of the scientists in the videos.

Children of the River
This episode profiles the people of Walpole Island, a Native American reservation in Canada where the waters appear to be contaminated by chemicals from across the river, and Dr. Bill Stapp, the father of environmental education. With the help of local teachers, Dr. Stapp introduces his Global Rivers Environmental Education Network (GREEN) to the schools of Walpole Island, teaching students to perform important chemical and biological tests to determine the quality of water in the river. These young citizens are learning to use their test results to support their claims when facing industry and community leaders and will continue, year after year, to take action on the river's behalf. The teacher's guide, developed for grades 6 to 9, provides activities that cover the topics of water treatment, indicators of water quality, recreation, transportation, the river as a food source, possible river contaminants, tests of water quality, and river dynamics.

Mystery through the Lens
In this episode, world-renowned microscopist Walter McCrone uses a simple light microscope to solve many mysteries that have stumped the scientific community including the questionable authenticity of the Shroud of Turin, the Atlanta child murders, and the authentification of a long lost Manet painting. The classroom activities, developed for grades 7 to 12, are designed around the use of optical microscopes and the creation of reference collections of samples of fibers, pigments, and surface debris so that students can identify unknown samples.

New Science of Sports
In this episode, scientists, biomechanists, and sports trainers analyze how great athletes function in sports such as race walking, ice skating, weight lifting, golf, swimming, and others. In addition, basketball superstar Michael Jordan discusses his athletic ability in terms of movement, training, genetics, and sports psychology. The teacher's guide, developed for grades 5 to 12, provides vocabulary and information about biomedical design, activities such as analyzing a student's vertical jump, and information on sports career options.

Statistics Workshop

Grades 6-12

Sunburst Communications, Inc.
101 Castleton Street
Pleasantville, NY 10570
Toll-free no.: (800) 321-7511
1 software package: $129.00
1 network version: $775.00

Subjects: Data analysis; Data interpretation; Mathematics; Real data; Statistics.

1992

ENC-001550

Abstract: This mathematics software program on statistics with teacher's manual for grades 6 to college is a set of computer tools designed for helping students explore and understand fundamental concepts of data analysis. The software program provides a system for entering, manipulating, and displaying data; viewing a statistical summary of the data; and creating a variety of subsets of the data. Four types of plots are available for displaying data: histogram, bar chart, box plot, and scatter plot. Included also in the software is a movable line that can be manipulated to fit the data points in a scatter plot. A fit meter shows how well the current line fits the data, and the equation of the line is displayed. The results can be checked against a best fit regression line with its equation. Another feature of the software is the ability to change a histogram by raising or lowering the bars in order to create a variety of distributions. The results of such changes on the mean, median, and quartiles can then be explored. The manual gives an overview of the software program; outlines teaching ideas; provides sample teacher-directed and student activities; gives information on statistics and data analysis in our world; and explains the interdisciplinary nature of statistics. Other information in the manual focuses on the NCTM Standards for grades 9 to 12 that relate to data analysis and statistics. A reference guide section of the manual defines terms and shows step by step how the program works on the computer. The appendix provides information on resources, warranty information, and directions to use different Macintosh systems. (Author/VN)

Author: Programmers, Lewis Pringle, Donald J.A. Redick, Sterling Wight, Kevin Lee; teacher's guide, Lois Edwards

Standards: NCTM standards (1989). — Content standards: Grades 5-8. — Statistics.
NCTM standards (1989). — Content standards: Grades 9-12. —Statistics.

Equipment: System requirements: Macintosh Plus or later model; 800K disk drive required; hard drive recommended.

Evaluation: Citations:

Dodge, Wally. "Technology Reviews: Statistics Workshop." *Mathematics Teacher.* October 1993, Vol. 86, No. 7, p. 611.
"Mathematics: Statistics Workshop." *School Library Journal.* May 1992, Vol. 38, No. 5 pp. 58-59.

Many software packages are available for teaching statistics and data analysis.

Data Insights
Designer, Lois Edwards; programmers, Stephen C. Birkelbach, Raoul Watso
Sunburst Communications
This software with accompanying teacher's guide and supplementary activities package is designed for grades 7 to 12 and enables students to work with large sets of real-world data. Students can experiment with data by displaying the data in six different customizable plot types and calculating various statistics. A separate *Insights into Science Data* activities package allows students to explore topics in life science, earth science, physical science, biology, chemistry, and physics. Included are student lab instructions and teacher notes, as well as a data disk containing data files. Another activities package, *Insights into Modelling,* strengthens graphing skills and function concepts by allowing students to collect and analyze paired data.

Using Charts, Graphs, and Tables

Grades 9-12

Center for Occupational Research and Development
601 C Lake Air Drive
Waco, TX 76710
Toll-free no.: (800) 231-3015
1 student text: $1.25
1 teacher's guide: $9.50
1 video: $50.00

Subjects: Agriculture; Applied mathematics; Business mathematics; Data analysis; Data collection; Data interpretation; Estimation; Graphing; Health occupations; Home economics; Industry; Job skills; Marketing; Mathematics; Measurement; Process skills; Real data; Real world applications; Tables (Data); Technology.
1988

ENC-000048

Abstract: *Applied Mathematics* is a set of modular units designed to develop job-related mathematics skills of vocational students in grades 9 to 12. Designed as a one-year course, the set may be used in its entirety, or separate units may be selected and integrated into an existing vocational course. Modular units focus on arithmetic operations, calculator use, problem-solving techniques, estimation, measurement, geometry, data handling, statistics, and use of algebraic formulas. This teacher's guide and student text are part of the fourth modular unit and cover interpretation and creation of bar graphs, circle graphs, line graphs, and tables. The teacher's guide includes: lesson plans; teacher's notes for hands-on mathematical laboratory activities in which groups of students collect and graph data; a set of 40 solved problems involving the areas of agriculture and agribusiness, business and marketing, health occupations, home economics, and industrial technology; and a problem bank with answers for an end-of-unit test. The student workbook provides an introduction to mathematics skills, laboratory activities, exercises, and a glossary. Each modular unit includes a video that illustrates applications in the world of work. (AM)

Author: Center for Occupational Research and Development

Practical applications of mathematics and how they are used in industry and business are stressed throughout this series of resources for high school students.

Patterns and Functions
This unit focuses on using patterns, relations, and functions to describe and solve problems. In the learning activities, students learn to: decode and expand patterns; represent mathematical relationships as tables of data, ordered pairs, graphs, equations, and word sentences; graph linear and quadratic functions; identify the domain and range of mathematical relations and functions; distinguish between mathematical relations and functions; and use patterns and functions to solve problems at home and at work.

Working with Probabilities
This teacher's guide and student text are part of the 20th modular unit and cover probabilities of simple events; counting; odds; independent and mutually exclusive events; and use of calculators, diagrams, and charts to find probabilities.

Quality Assurance and Process Control 1
This unit focuses on how to collect, organize, graph, and analyze production data to manufacture quality products within design specifications. In the learning activities, students learn to: distinguish between a manufacturing process and its product; make process charts; construct histograms, run charts, scatter diagrams, and normal distribution curves from data obtained by counting or measuring; use measures of central tendency and dispersion to describe data shown on bell-shaped curves; and compare data for process capability and tolerance band on normal distribution curves to determine production quality.

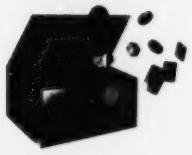
Working with Statistics
This learning module is the 19th unit in the set. Consisting of a student workbook, teacher's guide, and video, this unit concentrates on how to interpret information from data using basic statistical skills including measuring central tendency, measuring variability, and interpreting characteristics of a normal curve. Three laboratory activities require small teams of students to use measuring apparatus, collect data, and solve problems using calculators when possible.

Variables

Grades 5-6

Encyclopaedia Britannica Educational Corp.
310 South Michigan Avenue
Chicago, IL 60604
Toll-free no.: (800) 554-9862
1 complete module: $319.00
1 teacher guide: $101.00
1 teacher video: $51.00

Subjects: Capacity; Cycles; Experiments; Flight; Flotation; Pendulums; Physical sciences; Projectile motion; Real data; Science; Variables (Mathematics).



1992

ENC-000426

Abstract: The Full Option Science System (FOSS) series, designed for grades K to 6, consists of instructional modules organized under four topic headings: Life Science, Physical Science, Earth Science, and Scientific Reasoning and Technology. Each module includes a teacher guide and equipment kits. This module for grades 5 to 6 introduces students to the concept of a variable. In activity one, students systematically investigate weight, release position, and length of pendulums to discover which of these variables affects the number of swings the pendulum completes in a given period of time. In activity two, students use paper cup boats and penny passengers to figure out which variables influence the number of passengers a boat can hold. In activity three, students construct airplanes and fly them along a string to discover the effect of different variables (number of winds on the rubber band, slope of the string, and weight) upon the distance the plane will fly. In activity four, students launch objects of various sizes with a minicatapult. Variables that influence the height and distance objects travel are investigated, recorded, and graphed. The teacher guide consists of a module overview, a set of activity folios, duplication masters for the student sheets, an assessment package, FACTs (FOSS Activity Correlation Tables), and equipment inventory lists. The activity folio is a concise booklet for each activity, which provides a lesson plan; background information; a materials list; preparation plans; discussion questions; mathematics, language, social studies, and art extensions; home activities; and suggestions for including a multicultural dimension in the lesson. The duplication masters for the student sheets and assessment packages are written in both English and Spanish. English and Spanish versions of videotapes and videodiscs are available separately to supplement this module. (CCC)

Author: Lawrence Hall of Science, University of California

Audience: Bilingual students; English as second language (ESL) students; Hispanic American students; Minority students.

Evaluation: Organizational reviews: FOSS has been reviewed and selected for dissemination at workshops hosted by the following organizations: Phi Delta Kappa, Bloomington, IN; National Science Resources Center, Smithsonian Institution, Washington, DC.

The following states have reviewed and adopted FOSS: California, Florida, Georgia, West Virginia, Oklahoma, Arizona, Indiana, New Mexico, and Utah.

Citations:

Boyce, L.N., et al. *Consumer's Guide to Science Curriculum.* Williamsburg, VA: Center for Gifted Education, College of William and Mary, 1994. pp. 121-128.

Clementson, J. "A Qualitative Study of Elementary Teachers' and Students' Interactions with the Full Option Science System." Ed. D. dissertation, University of Nebraska, 1991.

Johnson, J. "Teaching Science to Students with a Wide Range of Abilities through the Use of Hands-On Experiences and Collaborative Groups." Master's Project, University of California, Berkeley, 1991.

Developer Field Tests: FOSS modules received three levels of field testing between September 1988 and May 1994: Phase 1: Project staff taught and scripted in numerous classrooms. Phase 2: Each module was used by at least 50 San Francisco Bay Area teachers in their classrooms. Four forms of feedback were collected to guide the revision of the modules for Phase 3. Phase 3: Each module was used by teachers in 10 national field test centers including rural, suburban, urban, and innercity settings. Feedback from national testing guided the final commercial revision.

What's In Our Water?

Grades 4-6

National Geographic Society
17th & M Streets, NW
Washington, DC 20036
Toll-free no.: (800) 368-2728
1 software package: $375.00

Subjects: Data analysis; Data collection; Data interpretation; Real data; Real world applications; Science; STS; Water; Water conservation; Water pollution; Water purification; Water quality; Water treatment; Water treatment plants; Watersheds.

1991

ENC-001515

Abstract: The National Geographic Society (NGS) Kids Network is a telecommunications-based science curriculum, recommended for students in grades 4 to 6. This unit allows students to investigate issues and collaborate as research scientists by conducting original research and finding their own answers. Using a computer, they record information, write letters, make graphs, display software generated maps, and send information electronically. This kit includes a demonstration disk and software manual of the capabilities of the Kids Network; a teacher's guide that provides six weeks of lesson plans and supplemental materials covering the topics of water quality testing with real data, the water cycle, and water pollution issues; 15 reproducible activity sheet masters; wall maps of the U.S., North America, and the world; and 30 copies of the *What's in Our Water?* kids handbook that provides basic information on pollution, water treatment, and clean water tips. There is a toll-free number to renew the telecommunications subscription and to reorder the nitrate test kit or replace other components. (Author/DEB)

Author: software developed by Technical Education Research Centers, Inc., produced in collaboration with the National Geographic Society

Equipment: System requirements: Apple IIGS with 512K RAM and ROM version 0.1 or higher; RGB color monitor; a 3.5 in. and a 5.25 in. disk drive; compatible printer; compatible modem. Also available for IBM and Macintosh at the same price.

Evaluations: Citations:

Alston, Patricia Gayle, Frederick W. Stoss. "Environment Online: The Greening of Databases." *DATABASE*. August 1992, Vol. 15, No. 4, p. 17.

Brown, Lonny J. "Environmentalism Goes Online: It's Only Natural." *Link-UP*. March 1994, Vol. 11, No. 2, p. 12.

Collier, Linda. "Review." *Canadian Social Studies*. Summer 1994, Vol. 28, p. 168.

Zethrus, Lee. "Streams of Knowledge." *The Dallas Morning News*. October 6, 1993, p. 1J.

Other resources are available that emphasize water quality monitoring.

The Tapwater Tour: The Hands-on Test Kit & Mini Curriculum for Exploring Drinking Water
LaMotte Co., Chestertown, MD, Toll-free no.: (800) 344-3100
This water test kit, developed for middle school students, provides materials to qualitatively assess drinking water samples from students' homes. The kit includes background information and the same chemical tablets professional water analysts use to test pH, chlorine, hardness, copper, and iron.

Science Demonstration Projects in Drinking Water: Grades K-12
U.S. Environmental Protection Agency, Office of Water, Washington, DC, Telephone no.: (202) 260-2285
This pamphlet includes nine science demonstration projects related to drinking water for K to 12 students.The general topics covered by the demonstration projects include the chemical and physical aspects of water, contamination and treatment of drinking water, distribution and supply of drinking water, and water conservation.

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Real Data on the Internet

Student-Generated Data

There are many Internet projects that emphasize data gathered by students in their own environments. Students must collect, manipulate, analyze, interpret, and communicate this data; they usually share their data with students in other parts of the country or even the world. Below are several different ways to learn about these Internet projects.

On the ENC Digital Curriculum Laboratory, teachers can read about several Internet projects. Investigate the different Internet projects available from many of the sites and groups featured there. From the 1994-1995 school year projects are two examples: 1) "Outdoors," in which a biology teacher in Arkansas invites other biology teachers to involve their classes in studying their local school grounds as ecosystems and sharing that data with other classrooms across the country; and 2) "Rainbow," in which students from all over the world share information about their cultural heritages for multidisciplinary lessons about different cultures.

In addition, there are several mailing lists for exchanging information between classes and schools. Mailing lists can be used in those schools that have nothing more than an e-mail address.

World Wide Web (WWW) Sites

Teachers or schools with access to the World Wide Web can also expand the range of real data for the classroom. WWW pages offer graphics and text, and often audio and video, to convey information from all over the world. Most Web sites have links to other related resources; these few examples are starting points for real data study.

Welcome to the Planets
http://stardust.jpl.nasa.gov/planets
This NASA page gives data about and images of the planets in our solar system. The images are from NASA's planetary exploration program and include images of particular geologic features and atmospheric phenomena for each planet. "Planet profile" for each planet gives several facts such as mass, density, surface temperature, atmospheric components, and surface materials.

Current U.S. Weather
http://www.mit.edu:8001/usa.html
A colorful weather map of the United States is the focus of this Web site. The map shows current weather conditions including temperature, weather fronts, and precipitation. Users can click on a specific location to get details and a forecast.

Welcome to the Michigan Technological University Volcanoes Page
http://www.geo.mtu.edu/volcanoes
This site contains information about volcanoes and volcanic activity around the world, including quite recent volcanic events. The site also highlights images and movies of lava, mudflows, and eruptions as well as statistics about particular volcanoes.

Malin's Antarctic Research
http://barsoom.msss.com/earth/antarctica/antarctic_intro.html
Research data and images from a long term study of the effects of physical and chemical processes in various microenvironments of Antarctica make up this Web site, which also includes information about putting this Web resource together.

Discovery: Insights through Advanced Computing
http://www.tc.cornell.edu/er/sci93
The Discovery pages contain articles and descriptions of how advanced computing is being used in several different contexts. One example is the "Nurturing tomorrow's scientists" pages which describe various high school classroom projects using advanced computing and student's real life data. "Modelling Mother Earth" describes the uses of a computer model of the world.

Finding Your Way with Map and Compass
http://info.er.usgs.gov/fact-sheets/finding-your-way/finding-your-way.html
The U.S.G.S. has created this page to describe different types of maps and their uses. The site explains the concept of scale and shows what different scales mean. Users also learn about compasses and how they should be used to determine direction.

Promising Practices for Real Data

The 10 Eisenhower Regional Consortia have produced a publication that highlights 50 promising practices in mathematics and science education. This publication, *Promising Practices in Mathematics and Science Education-1995*, was developed from a nationwide search and review process conducted by science and mathematics teachers and reviewers from various organizations, associations, and educational institutions. These innovative practices are intended to serve as models for improving teaching and learning in mathematics and science classrooms across the country.

With the cooperation of the Consortia, this issue of *ENC Focus* highlights three of the promising practices that are relevant for data analysis, collection, and interpretation in the classroom. Included here is a brief description of the programs in addition to contact information. For more information about *Promising Practices*, contact one of the ten Regional Consortia listed on the inside back cover of this catalog.

Earth Camp

Earth Camp provides an intensive, week-long, integrated science experience set in the ecologically unique Appalachian Mountains of Scott County, Virginia. The camp is operated with the support and involvement of numerous local volunteers, agencies, park personnel, and scientists. It provides interested secondary students with the opportunity to learn about and become actively involved in a variety of scientific disciplines such as earth and life sciences, chemistry, ecology, astronomy, and geology. Students learn first hand about scientific methods and ecological issues by engaging in such projects as conducting observable and microscopic stream life studies, doing water quality analysis, taking geological field trips to natural caves in the area, working with mining reclamation specialists at the Powell River Project, and conducting endangered mussel bed surveys with the Nature Conservancy.

For more information, contact: Danny Dixon, Director of Instruction, Scott County Schools, 261 E. Jackson St., Gate City, VA 24251, Telephone no: (703) 386-6118/Fax: (703) 386-2684

Image Processing for Teaching (IPT)

The goal of Image Processing for Teaching (IPT) is to provide professional development and curricular materials for a broad cross section of teachers nationwide who are looking for innovative applications of technology to science and mathematics and the training necessary to implement them. Using professional quality software on microcomputers, students explore a variety of scientific data sets, including biomedical imaging, Earth remote sensing and meteorology data, and planetary exploration images. They learn about the many mathematical concepts that underlie image processing, such as coordinate systems, slope and intercept, pixels, measurement, and statistics. The use of image processing is also an innovative method with which to engage students of all backgrounds in inquiry and discovery learning. By having the opportunity to create their own images to analyze and interpret, students and teachers change their traditional classroom roles and begin working together as a learning team.

For more information, contact: Melanie Magisos, Media Projects Coordinator, University of Arizona, Space Sciences Building, Tucson, AZ 85721, Telephone no: (602) 621-1767/Fax: (602) 621-5133

Macintosh-Using Science Teams (MUST)

The Macintosh-Using Science Teams (MUST) Summer Camp provides Miami, Florida, minority middle school students with an in-depth marine science enrichment experience. Forty-eight students in grades 7 to 9 attend a four-week session during the summer. They are divided into small research teams for cooperative group investigation of a topic within the general theme of human impact on the marine environment. Each day, the students participate in a 45-minute interactive seminar on a marine science topic. Then they directly apply what they have learned during field investigations at the nearby Biscayne Bay and Atlantic Ocean shorelines. The teams apply scientific methods while collecting information about their selected topics and use professional sampling and measuring instruments to conduct qualitative and quantitative surveys of the coastal marine ecosystems. This information is later discussed, analyzed, and processed in the computer lab. Computer technology is infused into all aspects of the program. Throughout the project, students' families are involved in helping to ensure student's success, for example, by encouraging their children to attend regularly. The summer camp culminates with a Family Night, during which each team uses a variety of multimedia techniques to present a report of their findings. Camp leadership and management is implemented by a marine scientist from the Miami Museum of Science and a science teacher from Dade County Public Schools.

For more information, contact: Alberto Ramirez, MUST Co-Director, Miami Museum of Science, 3280 South Miami Avenue, Miami, FL 33129, Telephone no: (305) 854-4247 ext. 257/Fax: (305) 285-5801/Internet: musetech@igc.apc.org

Other Federal Projects and Resources

4-H/Honda Mentorship Project

This project provides an opportunity for teams of teenagers to work with adult mentors in hands-on problem solving experiences in engineering at Honda's technical training sites across the country. The curriculum includes working as a team and managing time and resources to solve science-related problems.

Director, National 4-H Council
7100 Connecticut Avenue, NW
Chevy Chase, MD 20815
(301) 961-2853

The GLOBE Program

The National Oceanic and Atmospheric Administration is the lead agency for the GLOBE Program (Global Learning and Observations to Benefit the Environment), an international environmental education and science partnership. GLOBE is a partnership to establish a network of K-12 students around the world. Students will make environmental observations, share their information with each other, and provide data useful to environmental scientists.

Thomas N. Pyke, Jr., Director
The GLOBE Program
744 Jackson Place
Washington, DC 20503
(202) 395-7600/Fax: (202) 395-7611

NASA Spacelink

NASA provides this computer information service that allows individuals to receive news about current NASA programs, activities, and other space-related information, including historical and astronaut data, lesson plans, classroom activities and even entire publications. Anyone with a personal computer and a modem can access the network; Spacelink is also available through the Internet. The computer access number is (205) 895-0028. Internet addresses are spacelink.msfc.nasa.gov or xsl.msfc.nasa.gov.

Spacelink Administrator
Mail Code CA21
NASA Marshall Space Flight Center
Huntsville, AL 35812-0001
(205) 544-6360

Parks as Classrooms

This program offers teachers an opportunity to use the national parks to augment classroom instruction. Emphasis in most locations is on ecological and biological principles, while at a few locations geological, meteorological, and oceanographic principles are specified. The National Park Service offers workshops in the parks to encourage teachers to build their curricula around park services.

Robert Huggins, National Program Director
National Park Service
P.O. Box 37127
Washington, DC 20013-7127

Research and Engineering Apprenticeship Program (REAP)

This program provides minority and economically disadvantaged high school students with a cooperative education experience designed to introduce rewarding career opportunities in science and mathematics. During the apprenticeship, students are involved in hands-on experiences in research and development while working with university mentors who provide daily guidance.

Center for Education and Development
Academy of Applied Science
98 Washington Street
Concord, NH 03301
(603) 228-4530

Shuttle Amateur Radio Experiment (SAREX)

With the help of Amateur Radio clubs and ham operators, astronauts on designated shuttle flights make radio contacts while in orbit. The astronauts talk directly with teachers, parents, and communities. The American Radio Relay League, the Radio Amateur Satellite Corporation, and NASA's Education Division sponsor this shuttle experiment. The American Radio Relay League can provide educators with lesson plans and resource materials.

American Radio Relay League (ARRL)
225 Main Street
Newington, CT 06111
(203) 666-1541

Topics in Modern Physics National Institute

This 3-week institute for high school physics teachers at Fermi National Accelerator Laboratory provides a high energy physics research experience, instructional materials, and interaction with the world's foremost particle physicists. Teachers gain the ability to integrate cutting-edge science into their curricula.

Education Office
Fermi National Accelerator Laboratory
MS 226
P.O. Box 500
Batavia, IL 60510
(708) 840-3092/Fax: (708) 840-8248

Watchable Wildlife

This organization will create a national network of wildlife viewing areas by forming state coalitions that consist of Federal agencies, nonprofit organizations, and environmental associations. Future plans include the development of interpretive exhibits, visitor center, environmental and conservation programs, and education materials.

Mark Hillard, Wildlife Appreciation Program Manager
Western Fish and Wildlife Staff
3380 Americana Terrace
Boise, ID 83706
(208) 384-3088

*U.S. G.P.O.:1995-635-015

Please Send Me the Following Free ENC Materials:

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- ❑ *ENC Focus – Earth Day in the Classroom*
- ❑ *ENC Online Quick Reference Brochure*
- ❑ CD-ROM Request Form
- ❑ *ENC Submission Form*
- ❑ *ENC Update* (future issues)
- ❑ *Guidebook to Excellence* A Directory of Federal Programs

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Administrators, circle those for which you have responsibility K 1 2 3 4 5 6 7 8 9 10 11 12
Teacher educators, circle those for which you prepare teachers

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Directory of Eisenhower Mathematics and Science Regional Consortia

Appalachian Region
Eisenhower Math/Science Consortium at AEL
Pam Buckley, Director
Appalachia Educational Laboratory
PO Box 1348
Charleston, WV 25325
Phone: (304) 347–0400 • Fax: (304) 347–0487
States Served: Kentucky, Tennessee, Virginia, West Virginia

Central Region
Eisenhower High Plains Consortium for Mathematics and Science
John Sutton, Director
Mid-continent Regional Education Laboratory
2550 South Parker Road, Suite 500
Aurora, CO 80014
Phone: (800) 949–6387 • Fax: (303) 337–3005
States Served: Colorado, Kansas, Missouri, Nebraska, North Dakota, South Dakota, Wyoming

Mid-Atlantic Region
Mid-Atlantic Consortium for Mathematics and Science Education
Keith Kershner, Director
Research for Better Schools
444 North Third Street
Philadelphia, PA 19123
Phone: (215) 574–9300 • Fax: (215) 574–0133
States Served: Delaware, Washington, DC, Maryland, New Jersey, Pennsylvania

Midwestern Region
Midwest Consortium for Mathematics and Science Education
Gil Valdez, Director
North Central Regional Education Laboratory
1900 Spring Road, Suite 300
Oak Brook, IL 60521
Phone: (708) 571–4700 • Fax: (708) 571–4716
States Served: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, Wisconsin

Northeast and Islands Region
Regional Alliance for Mathematics and Science Education Reform
Eileen Ferrance, Director
300 Brickstone Square, Suite 900
Andover, MA 01810
Phone: (508) 470-0098 • Fax: (508) 475–9220
States/Areas Served: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont, Puerto Rico, Virgin Islands

Northwest Region
Northwest Consortium for Mathematics and Science Teaching
Rob Larson, Director
Northwest Regional Educational Laboratory
101 SW Main Street, Suite 500
Portland, OR 97204
Phone: (503) 275-9500 • Fax: (503) 275–9489
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